

## REMARKS

The acknowledgement of the request for continued examination in paragraph 1 of the Office Action has been noted.

In paragraph 3 of the Office Action, claims 9-11 were rejected under 35 U.S.C. §112, second paragraph, for failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention.

Reconsideration is requested.

Claim 9 has been canceled and claims 10 and 11 have been made dependent on claim 1. For these reasons, it is requested that this ground of rejection be withdrawn.

In paragraph 5 of the Office Action, claims 1-7 and 9-12 were rejected under 35 U.S.C. §102(b) as being anticipated by Japanese document 2715138.

Reconsideration is requested.

The cited Japanese document 2715138 (Japanese '138) is directed to a sealant and therefore the present invention which is directed to an optical wave guide element is entirely different in its object of the invention.

Amended claim 1 of the present invention differs in the amount of  $\text{TiO}_2$  that is disclosed in Japanese '138. Japanese '138 discloses that, if the amount  $\text{TiO}_2$  exceeds 3%, crystallinity becomes so strong that the sealant characteristics are deteriorated (column 4, lines 18 -21 of Japanese '138). On the other hand, in the claimed invention,  $\text{TiO}_2$  is an important ingredient that functions to adjust the thermal expansion coefficient and also functions as a nucleating agent. In order to achieve the required thermal expansion coefficient, the amount of  $\text{TiO}_2$  is preferably 3.5% or more. Japanese '138 does not teach or suggest the composition defined by the amended claims which require the presence of a minimum of 3.5% of  $\text{TiO}_2$ . For these reasons, the amended claims are not anticipated by Japanese '138 and it is requested that this ground of rejection be withdrawn.

In paragraph 6 of the Office Action, claims 1-5 and 7 were rejected under 35 U.S.C. §102(b) as being anticipated by SU695979.

Reconsideration is requested.

The glass of SU695979 is a quartz glass and not a glass-ceramic. For this reason, the structure of the glass of the cited reference is entirely different from that of the glass-ceramic of the present invention and there is no anticipation of the claims of the present application. In addition, the quartz glass of the cited reference is intended for use in producing tungsten and molybdenum seals. A quartz glass can not anticipate the novelty of a glass-ceramic composition.

Moreover, the quartz glass of the cited reference does not contain any  $\text{TiO}_2$  or  $\text{MgO}$  and, therefore, the glass-ceramic of the present invention differs also in the composition from the glass reference. For these reasons, it is requested that this ground of rejection be withdrawn.

In paragraph 7 of the Office Action, claims 1-4, 7 and 9-12 were rejected under 35 U.S.C. §102(b) as being anticipated by Gotoh et al. (Gotoh).

Reconsideration is requested.

The claims of the present application point out a glass-ceramic composition which contains 0.5 - 2%  $\text{MgO}$ . This composition is distinctly different from the composition disclosed in the cited reference which contains 3.5 - 20%  $\text{MgO}$ . In the present invention,  $\text{MgO}$  is added in the amount of at least 0.5% but should not exceed 2% in order to prevent deterioration in the transparency of the glass-ceramics. Since the glass-ceramic of the present invention is directed to an optical waveguide element, as one of its uses, loss of transparency should be avoided. On the other hand, the cited reference is directed to glass for a magnetic head and therefore transparency is of no concern. Moreover the cited reference points out that, if the

amount of MgO is less than 3.5%, the melting property of the glass deteriorates, the glass is destabilized and the hardness of the products is reduced. There is no description of the advantageous results that are obtained by adding 0.5 - 2% MgO. For these reasons, the cited reference does not anticipate the amended claims and it is requested that this ground of rejection be withdrawn.

In paragraph 8 of the Office Action, claims 1-13 and 43 were rejected under 35 U.S.C. §102(e) as being anticipated by Goto.

Reconsideration is requested.

In the cited reference, P, Ti and Zr are used as nucleating agents of the glass-ceramic and the linear thermal expansion coefficient in the vicinity of 0 appears to be achieved by the combination of these components. In contrast, in the present invention, addition of P reduces the linear thermal coefficient to such a degree that a glass-ceramic having required properties cannot be obtained.

The claims of the present application point out an average linear thermal expansion coefficient ( $\alpha$ ) within a range from  $+6 \times 10^{-7}/^{\circ}\text{C}$  to  $+35 \times 10^{-7}/^{\circ}\text{C}$  is required. In the cited reference, the average linear thermal expansion coefficient ( $\alpha$ ) within a range from  $-20 \times 10^{-7}/^{\circ}\text{C}$  to  $+20 \times 10^{-7}/^{\circ}\text{C}$ , i.e., in the vicinity of 0 is required. Further, in the specification of the present application, it is noted that it is preferable not to add  $\text{P}_2\text{O}_5$  for producing the low expansion transparent glass-ceramics (page 15, lines 21-23) and, therefore, the present invention differs from the cited reference which requires  $\text{P}_2\text{O}_5$  as an essential component for improving the melting property. the disclosure of the compositions which avoids the presence of  $\text{P}_2\text{O}_5$  is the basis for the recitation in amended claims 1 and 43 that the composition is substantially free of  $\text{P}_2\text{O}_5$ . For these reasons, it is requested that this ground of rejection be withdrawn.

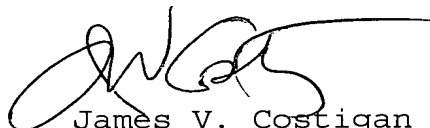
In paragraph 9 of the Office Action claims 1-13 and 43 were rejected for double patenting over claims 1-12 of U.S. 5,972,816 ('816 patent).

Reconsideration is requested.

The claims of the '816 patent do not disclose any information about the coefficient of thermal expansion or the transparency of the product described in the claims. Claims 9-11 point out that 6-10% of the composition is  $P_2O_5$ , while the claims of the present application point out that there is substantially no  $P_2O_5$  present. For these reasons, there is no double patenting between the claims of the '816 patent and the amended claims of the present application.

An early and favorable action is earnestly solicited.

Respectfully submitted,



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